



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/833,385	04/11/2001	Mukul Khosla	NOVLP014/NVLS-000388	3786

22434 7590 08/12/2003

BEYER WEAVER & THOMAS LLP
P.O. BOX 778
BERKELEY, CA 94704-0778

EXAMINER

NICOLAS, WESLEY A

ART UNIT	PAPER NUMBER
----------	--------------

1742

DATE MAILED: 08/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/833,385

Applicant(s)

KHOSLA, MUKUL

Examiner

Wesley A. Nicolas

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) 20-26 and 31-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-19 and 27-30 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3, 2
- 4) ☒ Interview Summary (PTO-413) Paper No(s). 4
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restriction

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-19 and 27-30, drawn to a method, classified in class 205, subclass 81.
 - II. Claims 20-26, and 31-33, drawn to an apparatus, classified in class 204, subclass 228.1.
 - III. Claims 34-35, drawn to a computer program, classified in class 709, subclass 1+.
2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used to practice another and materially different process such as the sampling of a completely different solution, e.g. wastewater.

Inventions I and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different functions, namely the invention of

group I is directed to a method of controlling an electroplating process and the invention of group III is directed to a computer program product, both patentably distinct inventions.

Inventions II and III are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different functions, namely the invention of group II is directed to a method of controlling an electroplating apparatus and the invention of group III is directed to a computer program product, both patentably distinct inventions.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Jeffrey Weaver on July 28, 2003, a provisional election was made **with** traverse to prosecute the invention of Group I, claims 1-19 and 27-30. Affirmation of this election must be made by applicant in

Art Unit: 1742

replying to this Office action. Claims 20-26 and 31-35 have been **withdrawn** from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Specification

6. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: "Closed loop monitoring of electroplating bath constituents using mass spectrometry".

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1-4, 9-11, 18-19, and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Calvert et al. (U.S. 2002/0060157 A1).

Claim 1 is rejected because Calvert et al. teach a method of controlling an electroplating process, the method comprising:

- (a) obtaining a sample of electrolyte from the electroplating process (Fig. 3, numeral 20 and ¶ 0047);
- (b) analyzing the sample of electrolyte by mass spectrometry to obtain a mass spectral result (¶ 0047 and Fig. 3, numerals 35, 40, 45, and 50);
- (c) comparing the mass spectral result to a plurality of known mass spectral results (Fig. 4, numeral 40 and ¶ 0047);
- (d) adjusting the conditions of the electroplating process in response to the comparison (¶ 0047).

Claim 2 is rejected because Calvert et al. teach that the sample of electrolyte is obtained directly from a plating cell of the electroplating process (¶ 0015 to ¶ 0020).

Claim 3 is rejected because Calvert et al. teach that the sample of electrolyte is obtained directly from a separate sampling vessel of the electroplating process (¶ 0015 to ¶ 0020).

Claim 4 is rejected because Calvert et al. teach that the sample of electrolyte is obtained from a central chemistry vessel of the electroplating process (¶ 0015 to ¶ 0020).

Claim 9 is rejected because Calvert et al. teach that the plurality of known spectral results are provided for a plurality of compositions comprising at least one of organic plating additives and breakdown products of said additives (¶ 0047).

Claim 10 is rejected because Calvert et al. teach of adjusting conditions of the electroplating process by adjusting apparatus hardware (¶ 0047 and Fig. 3, numeral 55).

Claim 11 is rejected because Calvert et al. teach that the adjusting apparatus hardware comprises adjusting the electrolyte composition (¶ 0047).

Claim 18 is rejected because Calvert et al. teach that the mass spectral result is obtained for each wafer processed (¶ 0047).

Claim 19 is rejected because Calvert et al. teach that the mass spectral result is obtained multiple times for each wafer processed (¶ 0047).

Claim 27 is rejected because Calvert et al. teach a method of controlling a wafer wet process in integrated circuit fabrication, the method comprising:

- (a) obtaining a sample of processing solution from the wafer wet process (Fig. 3, numeral 20 and ¶ 0047);
- (b) analyzing the sample of processing solution by mass spectrometry to obtain a result (¶ 0047 and Fig. 3, numerals 35, 40, 45, and 50);
- (c) comparing the mass spectral result to a plurality of known mass spectral results (Fig. 4, numeral 40 and ¶ 0047);
- (d) adjusting the conditions of the wafer wet process in response to the comparison (¶ 0047).

9. Claims 1-4, 10-11, 18-19, and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Cheung et al. (U.S. 2002/0033340 A1).

Claim 1 is rejected because Cheung et al. teach a method of controlling an electroplating process, the method comprising:

- (a) obtaining a sample of electrolyte from the electroplating process (Fig. 4, numeral 410);
- (b) analyzing the sample of electrolyte by mass spectrometry to obtain a mass spectral result (Fig. 4, numeral 420 and ¶ 0087);
- (c) comparing the mass spectral result to a plurality of known mass spectral results (Fig. 4, numeral 450);
- (d) adjusting the conditions of the electroplating process in response to the comparison (Fig. 4, numeral 460).

Claim 2 is rejected because Cheung et al. teach that the sample of electrolyte is obtained directly from a plating cell of the electroplating process (Fig. 4, numeral 410 and ¶ 0060).

Claim 3 is rejected because Cheung et al. teach that the sample of electrolyte is obtained directly from a separate sampling vessel of the electroplating process (¶ 0061, first and second electrochemical baths).

Claim 4 is rejected because Cheung et al. teach that the sample of electrolyte is obtained from a central chemistry vessel of the electroplating process (¶ 0061: first and second electrochemical bath)

Claim 10 is rejected because Cheung et al. teach of adjusting conditions of the electroplating process by adjusting apparatus hardware (Fig. 4, numeral 460).

Claim 11 is rejected because Cheung et al. teach that the adjusting apparatus hardware comprises adjusting the electrolyte composition (Fig. 4, numeral 460).

Claim 18 is rejected because Cheung et al. teach that the mass spectral result is obtained for each wafer processed (Fig. 4 and ¶'s 0059-0098).

Claim 19 is rejected because Cheung et al. teach that the mass spectral result is obtained multiple times for each wafer processed (Fig. 4).

Claim 27 is rejected because Cheung et al. teach a method of controlling a wafer wet process in integrated circuit fabrication, the method comprising:

- (a) obtaining a sample of processing solution from the wafer wet process (Fig. 4, numeral 410);
- (b) analyzing the sample of processing solution by mass spectrometry to obtain a result (Fig. 4, numeral 420 and ¶ 0087);
- (c) comparing the mass spectral result to a plurality of known mass spectral results (Fig. 4, numeral 450);
- (d) adjusting the conditions of the wafer wet process in response to the comparison (Fig. 4, numeral 460).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 1742

11. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

12. Claims 5-6, 17, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Calvert et al. (U.S. 2002/0060157 A1), as applied to claims 1 and 27 above, and further in view of Hansen (5,644,131).

Calvert et al. are as applied, argued, and disclosed above and incorporated herein but fail to teach the specific type of mass spectrometer, or the analyzing of a whole cassette of wafers.

Hansen et al. teach the use of pressure ionization mass spectrometry, quadrupole mass spectrometry, and time-of-flight mass spectrometry (col. 1).

Claims 5-6 and 28 are rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have modified Calvert et al. to use a specific type of mass spectrometer as taught by Hansen et al. because Hansen et al. teach the use of pressure ionization mass spectrometry, quadrupole mass spectrometry, and time-of-flight mass spectrometry (col. 1) which allows the user to tailor the type of mass spectrometer to the type of material that is being detected, thereby increasing overall efficiency.

Although neither Calvert et al. nor Hansen et al. teach the measurement of a cassette of wafers, claim 17 is rejected because the measurement of a cassette of wafers instead of a single wafer is merely a duplication of parts and it has been held that duplication of parts has little patentable significance unless new and unexpected results are produced. In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) .

13. Claims 5-6, 17, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheung et al. (U.S. 2002/0033340 A1), as applied to claims 1 and 27 above, and further in view of Hansen (5,644,131).

Cheung et al. are as applied, argued, and disclosed above and incorporated herein but fail to teach the specific type of mass spectrometer, or the analyzing of a whole cassette of wafers.

Hansen et al. teach the use of pressure ionization mass spectrometry, quadropole mass spectrometry, and time-of-flight mass spectrometry (col. 1).

Claims 5-6 and 28 are rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have modified Cheung et al. to use a specific type of mass spectrometer as taught by Hansen et al. because Hansen et al. teach the use of pressure ionization mass spectrometry, quadropole mass spectrometry, and time-of-flight mass spectrometry (col. 1) which allows the user to tailor the type of mass spectrometer to the type of material that is being detected, thereby increasing overall efficiency.

Although neither Cheung et al. nor Hansen et al. teach the measurement of a cassette of wafers, claim 17 is rejected because the measurement of a cassette of wafers instead of a single wafer is merely a duplication of parts and it has been held that duplication of parts has little patentable significance unless new and unexpected results are produced. In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) .

14. Claims 7-8 and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Calvert et al. (U.S. 2002/0060157 A1), as applied to claims 1 and 27 above and further in view of Reid (6,458,262).

Calvert et al. are as applied, argued, and disclosed above and incorporated herein but fail to teach the storage of results in a memory device.

Reid teaches the storage of results in a memory device (Fig. 5, numerals 504, 506, and 508) and further teaches determining whether the result falls within a specified tolerance of a target result that is one of the plurality of known results (Fig. 4, numeral 403).

Claims 7-8 and 29-30 are rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have modified Calvert et al. to use storage of data in a memory device as taught by Reid because Reid teaches the storage of a plurality of known electrolyte property results are stored in a memory device (Fig. 5, numerals 504, 506, and 508) and further determining whether

the result falls within a specified tolerance of a target result that is one of the plurality of known results (Fig. 4, numeral 403), which would have increased the efficiency of the operation of the method by decreasing time between each operation.

15. Claims 7-8 and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheung et al. (U.S. 2002/0033340 A1), as applied to claims 1 and 27 above and further in view of Reid (6,458,262).

Cheung et al. are as applied, argued, and disclosed above and incorporated herein but fail to teach the storage of results in a memory device.

Reid teaches the storage of results in a memory device (Fig. 5, numerals 504, 506, and 508) and further teaches determining whether the result falls within a specified tolerance of a target result that is one of the plurality of known results (Fig. 4, numeral 403).

Claims 7-8 and 29-30 are rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have modified Cheung et al. to use storage of data in a memory device as taught by Reid because Reid teaches the storage of a plurality of known electrolyte property results are stored in a memory device (Fig. 5, numerals 504, 506, and 508) and further determining whether the result falls within a specified tolerance of a target result that is one of the plurality of known results (Fig. 4, numeral 403), which would have increased the efficiency of the operation of the method by decreasing time between each operation.

Allowable Subject Matter

16. Claims 12-16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

17. The following is a statement of reasons for the indication of allowable subject matter:

The specific adjustment of hardware which comprises adjusting an electrical current flow, field shaping apparatus, voltage level, the relative orientation of an electrode with a counter electrode, or wafer handling apparatus was not taught or suggested by the prior art of record. Applicant is advised to amend said limitations into functional language (*i.e.* the apparatus is adapted to adjust an electrical current flow, etc.).

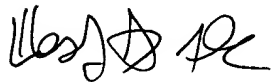
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley Nicolas whose telephone number is (703)305-0082. The examiner can normally be reached on Mon.-Thurs. from 7am to 5pm.

The Supervisory Primary Examiner for this Art Unit is Roy King whose telephone number is (703) 308-1146.

The fax number for this Group is (703) 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

A handwritten signature in black ink, appearing to read 'Wesley A. Nicolas'.

Wesley A. Nicolas

August 6, 2003